**Pre-Calculus**

* 1. **Notes**

**Day 7**

1. **Shifting graphs**

* Vertical and horizontal shifts

1. Vertical upward: h(x) = f(x) + c
2. Vertical downward: h(x) = f(x) – c
3. Horizontal right: h(x) = f(x – c)
4. Horizontal left: h(x) = f(x + c)

* Family of functions: have same shape but because of vertical/ horizontal shifts are in different locations

Use a calculator to graph the following family:

1. f(x) = x2
2. g(x) = (x – 4)2
3. h(x) = (x – 4)2 + 3

**Ex. 1:**  Sketch…

1. g(x) = x3 – 1
2. h(x) = (x + 2)3 + 1
3. **Reflecting graphs**

* Reflections in the coordinate axes

1. Reflection in the x-axis: h(x) = -f(x)
2. Reflection in the y-axis: h(x) = f(-x)

**Ex. 2:** Given

Find equations for the following shifting and reflecting graphs:



**Ex. 3:** Compare the following graphs with f(x) =.

1. g(x) =
2. h(x) =
3. k(x)=
4. **Non-rigid transformations**

* These cause distortions (a change in the shape of the original graph).

Given: f(x)

1. g(x) = c f(x) →
2. c > 1 (vertical stretch)
3. 0 < c < 1 (vertical shrink)
4. g(x) = f(cx) →
5. c > 1 (horizontal shrink)
6. 0 < c < 1 (horizontal stretch)

Using the calculator, compare f(x) = |x| to…

1. g(x) = 3|x|
2. h(x) =
3. k(x) = |3x|